



Evapotranspiration from sub-canopy vegetation in an old coniferous plantation of *Chamaecyparis obtusa* in Japan

Masahiro Takagi (1) and Makiko Tateishi (2)

(1) University of Miyazaki, Japan (mtakagi@cc.miyazaki-u.ac.jp), (2) Kyoto University, Japan

Evapotranspiration is a substantial component of forest hydrologic budgets. In coniferous plantations (i.e. man-made forests for timber production), sub-canopy vegetation that is naturally regenerated and consists of lower height trees is thought to contribute to the entire evapotranspiration of forests. The objective of this study is to quantify the interception loss and transpiration from both sub-canopy vegetation and top-canopy layer of the Japanese cypress *Chamaecyparis obtusa*.

The study was conducted in a 90-year-old cypress plantation in southwestern Japan for 12 months from March 2003. Tree density and height of the top-canopy cypress and sub-canopy broad-leaved trees were 770 trees/ha and 22 m, and 6300 trees/ha and approximately 9 m, respectively. The interception loss was estimated from throughfall and stemflow measurements. Transpiration was measured as the rate of xylem sapflow using thermal dissipation probes. The throughfall collectors were set on the ground and at the top of a climbing frame at a height of 9 m, in order to divide the interception loss into top- and sub-canopy layers. Stemflow was measured with eight trees of the top-canopy cypress and seven trees of the sub-canopy trees. The probes for sapflow measurement were inserted in 13 top-canopy cypress and 12 sub-canopy trees.

Annual rainfall was 3089 mm, which is the average rainfall of the last 10 years. Total interception loss, that of top-canopy cypress, and that of sub-canopy vegetation were 930, 595, and 335 mm, respectively. Ratio of these variables to the rainfall were 0.30, 0.19, and 0.11, respectively. Approximately one-third of the total interception loss was due to the sub-canopy vegetation. The sub-canopy vegetation increased the interception loss of the cypress plantation by approximately 60%. Total transpiration, that of top-canopy cypress, and that of sub-canopy vegetation were 443, 296, and 147 mm, respectively. Ratio of these variables to the rainfall were 0.144, 0.096, and 0.047, respectively. One third of the transpiration was due to the sub-canopy vegetation. The sub-canopy vegetation increased the transpiration of the cypress plantation by 50%. In total, the evapotranspiration was 1373 mm; the sub-canopy vegetation increased the transpiration by 50%. The fairly dense sub-canopy vegetation contributed to the evapotranspiration of the cypress plantation substantially.